Using Manufacturing Message Specification for Monitor and Control at Venus

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A new approach to the monitor and control of spacecraft tracking systems has been developed based on the Open Systems Interconnection (OSI) process control standard Manufacturing Message Specification (MMS). Station subsystems are interconnected using commercial MMS software to support interprocessor communication across a Local Area Network (LAN). Significant cost savings are realized through the incorporation of commercial Software Control and Data Acquisition (SCADA) packages to support the operator interface. A pilot system has been installed and is in operation at the Deep Space Network (DSN) experimental Venus complex.

The DSN operates a new 34-meter beam waveguide antenna (DSS-13) at the Goldstone Venus complex in California. The complex composed of various pieces of equipment with some equipment under computer automated control. The Station Monitor and Control (SMC) system is composed of a computer workstation with a commercial SCADA package, a Local Area Network to provide communications to all subsystems and commercial MMS communication software on all subsystems. The function requirements for SMC are:

    o Provide a workstation to support centralized monitor and control all of the equipment at the station.

    o Provide the communications necessary to monitor and control all of the equipment at the station.

    o Provide for the distribution of support data at the station.

    o Provide a graphical user interface which can be tailed by station personnel to meet changing operational requirements.

    o Provide an open system environment capable of easy, rapid expansion (addition of new subsystems without new SMC software deliveries).

    o Provide an open system environment capable of supporting automation.

The Venus experience demonstrates that OSI based standards can be successfully implemented to support interprocessor communications in a tracking complex. The MMS protocol meets the functional requirements for monitor and control, and provides the foundation for station automation. The application of a table driven SCADA system combined with the open systems protocols provides an environment for the introduction of new subsystems without new M&C software deliveries.

The experience has also highlighted some important lessons learned on the application of Commercial-Off-The-Shelf (COTS) hardware and software products, and the importance of good systems engineering. As a "breadboard " for a M&C system for the DSN operational systems, the Venus SMC system has provided valuable insights and a proof of feasibility for an overall architecture. This paper will describe the architecture of the Venus SMC system, discuss the application of MMS, discuss the requirements imposed on subsystems, and discuss the results of operational testing at the Venus complex.